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Spring 2020

## ENE 262-004: Introduction to Environmental Engineering

Wen Zhang

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## ***ENE 262 – INTRODUCTION TO ENVIRONMENTAL ENGINEERING***

**Spring 2020**

**Instructor:** Wen Zhang, Ph.D., P.E., BCEE

**Office Hours:** Every Wednesday from 1:00 pm to 4:00 pm or by appointment

Room 211 Colton Hall

Phone: (973) 596-5520

Email: wen.zhang@njit.edu

**Lecture location/time:** 9:15 am - 11:20 am (Wednesday and Friday) @ Electrical & Computer Engr Ctr 115. Jan 21, 2020 - May 14, 2020

We will use Webex similar to our online classes now to hold office hours meetings to discuss detailed issues or calculations. The office hour is not restricted to the posted official hours now and faculty/students will determine the specific time for webex meeting on demand.

**ENE Lab TAs:** Shan Xue (Lucie), sx59@njit.edu

**Office:** Room 421 Colton Hall.

### **Description:**

To introduce students to the interdisciplinary science, engineering, design and management concepts of engineered environmental systems. The course will cover environmental parameters, mass balance and natural systems, water quality management, water and wastewater treatment, air pollution control, noise pollution, and solid and hazardous waste management. Background material and laboratories in the environmental sciences and management areas will be covered. Group term papers and presentations will be required.

**Prerequisites:** Chem 125, Math 112, and Phys. 121

### **Course Objectives:**

1. Provide students with the scientific background needed to assess environmental quality in terms, of the physical, chemical and biological aspects.
2. Provide students with the tools necessary to understand mass balance in environmental systems.
3. Provide students with the basic scientific and engineering principles and technologies in water and wastewater treatment, air pollution control, noise pollution, and solid and hazardous waste management.
4. Introduce students to technical writing, literature search and digestion and case studies.

### **Textbook(s)/Materials Required:**

- 1) Davis, M.L. and Cornwell, D.A., Introduction to Environmental Engineering, 5<sup>th</sup> Edition, McGraw Hill Companies, New York, NY, 2013, ISBN 978-0-07-340114-0
- 2) Handouts/slides

### **Grading:**

Midterm exam	20%
Final Exam	20%
Three lab sessions and reports	15%
Now only two laboratory reports and the third laboratory testing will be replaced a modeling experiment project	
Homework assignments	30%
Attendance and random sign-in sheet or quizzes	15%

**No late homework is accepted (no exceptions). Students need to make proper arrangement to meet homework or project deadlines. However, additional assignment may be available for grade**

**makeup.**

**Final grade**

=IF(>90,"A",IF(>85,"B+",IF(>70,"B",IF(>65,"C+",IF(>55,"C",IF(>50,"D"))))))))

**Tentative course schedule or guideline (Subject to changes with advance notices)**

Week	Class date	Topic	Reading Assignments
1	01/22 01/24	Introduction to the roles of environmental engineering and career opportunities for students Special guest talks and discussions on climate change and impacts on developing countries.	Ch. 1 Ch.13 Ch. 2
2	01/29 01/31	Disinfection against microbial pathogens Basic Mass and Energy transfer and balance; reaction kinetics, reactors, unit conversion and practice	Ch.2 Ch.3 Ch.4 Ch.5
3	02/05 02/07	Water chemistry fundamentals One-hour lecture by librarian speaker from NJIT library to demonstrate the reference use, scientific writing, and library resources.	Ch.5
4	02/12 02/14	Water reuse technologies Water Chemistry (alkalinity, hardness, dissolution, etc.)	Ch.5
5	02/19 02/21	Water Chemistry (alkalinity, hardness, dissolution, etc.) Water Treatment and Water Pollution	Ch.5 Ch. 6
6	02/26 02/28	Surface water treatment Wastewater Treatment Technologies-adsorption	
7	03/04 03/06	First lab in Colton 414: alkalinity <i>Special topic: plastic pollution lecture</i> Membrane filtration	Ch. 6
8	03/11 03/13	Second Lab in Colton 414: hardness Multi-media filtration	Ch. 6 Ch. 7
9	03/18 03/20	Spring break	
10	03/25 03/27	<b>Midterm exam</b> Field trip has been replaced by a regular lecture class	
11	04/01 04/03	Third Lab in Colton 414: jar tests or adsorption test	Ch.8
12	04/08 04/10	Air flotation April 10: Good Friday (No class)	Ch.8
13	04/15 04/17	Electrochemistry and microbial fuel cell	Ch.9
14	04/22 04/24	Air Pollution & Control	Ch.10
15	04/29 05/01	Noise Pollution & Control	
16	05/06 05/08	No class; reading day	
17	05/13 05/15	<b><u>Final Exam date/location TBD</u></b>	

**Program Educational Objectives Addressed: 1, 2**

**Course Objectives Matrix – ENE 262 Introduction to Environmental Engineering**

<b>Strategies, Actions and Assignments</b>	<b>ABET Student Outcomes (1-7)</b>	<b>Program Educational Objectives</b>	<b>Assessment Measures</b>
<b>Student Learning Outcome 1: Describe and discuss relevant environmental regulations ethics and standards; the driving forces behind environmental science and engineering projects.</b>			
Define environmental science and engineering	4, 7	1	Homework, class, discussions and examinations.
Explain and discuss current and proposed relevant regulations, standards and ethical rules.	4	1	Homework and examinations.
<b>Student Learning Outcome 2: Assess environmental quality in terms of the physical, chemical and biological aspects.</b>			
Provide an overview of environmental sciences and parameters.	1, 2	1, 2	Homework, class discussions, and examinations.
Conduct experiments in the environmental sciences.	6, 5	1, 2	Laboratory group discussions and laboratory reports.
<b>Student Learning Outcome 3: Illustrate mass balance in environmental systems.</b>			
Illustrate the mass balance approach.	1, 2	1, 2	Homework, class examples and examinations.
<b>Student Learning Outcome 4: Recognize the basic scientific and engineering principles of water and wastewater treatment, air pollution control, noise pollution, and solid and hazardous waste management.</b>			
Introduce the scientific and engineering principles of water treatment.	2	1, 2	Homework, class discussions and examinations.
Introduce the scientific and engineering principles of wastewater treatment.	2	1	Homework, class discussions, and examinations.
Introduce the scientific and engineering principles of air pollution and control	2	1	Homework, class discussions and examinations.
Introduce the scientific and engineering principles of noise pollution and control.	2	1	Class examples, and examinations.
Introduce the scientific and engineering principles of solid and hazardous waste management.	2	1	Homework, class discussions, and examinations.
<b>Course Objective 5: Practice environmental report writing.</b>			
Provide the mechanisms of environmental report writing.	3	1, 2	Class discussions and case study paper.

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarship among our faculty and students
- to promote service to the engineering profession and society

Our program educational objectives are reflected in the achievements of our recent alumni:

1 – Engineering Practice: Alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.

2 – Professional Growth: Alumni will advance their skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as business and law through further education.

3 – Service: Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.

Our Student Outcomes are what students are expected to know and be able to do by the time of their graduation:

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Revised: 2/13/18

**Accessibility:**

Any student who has a need for accommodation based on the impact of a disability should contact the Instructor privately to discuss the specific situation as soon as possible. Contact Disability Resources and Services to coordinate reasonable accommodations for students with documented disabilities. The NJIT web site below provides additional information: <http://www.njit.edu/counseling/services/disabilities.php>

**Participation:**

Your participation in this class is important. Occasionally we will have in-class example problems and quizzes. Thus, you should always bring a calculator with you to class. In addition, students are expected to come to class to learn and no extra assistance on lecture content could be offered through e-mailing, text messaging, or phone calling. Cell phones should also be completely turned off or placed in vibrate mode.

**Thinking critically and independently:**

It is my sincere hope that as a graduate of Engineering, each student will be a thoughtful citizen as well as a fundamentally sound engineer. Your questions, thoughts, and comments are valuable and encouraged throughout this course.

**Academic integrity:**

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: <http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at [dos@njit.edu](mailto:dos@njit.edu)